

SIEMENS

PATENT
Attorney Docket No. 2003P08417WOUS

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Inventor:	J. Reinschke)	Group Art Unit:	3725
)		
Serial No.:	10/574,723)	Examiner:	M.G. Katcoff
)		
Filed:	April 6, 2006)	Confirmation No.:	1912
)		
Title	METHOD AND CONTROL DEVICE FOR OPERATING A MILL TRAIN FOR METAL STRIP			

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APPELLANTS' BRIEF UNDER 37 CFR 41.37

Sir:

This brief is in furtherance of the Notice of Appeal filed in this application on 9 February 2011.

(Please proceed to the following page.)

1. REAL PARTY IN INTEREST - 37 CFR 41.37(c)(1)(i)

The real party in interest in this Appeal is the assignee of the present application, Siemens Aktiengesellschaft.

2. RELATED APPEALS AND INTERFERENCES - 37 CFR 41.37(c)(1)(ii)

There is no other appeal, interference or judicial proceeding that is related to or that will directly affect, or that will be directly affected by, or that will have a bearing on the Board's decision in this Appeal.

3. STATUS OF CLAIMS - 37 CFR 41.37(c)(1)(iii)

Claims canceled: 1 – 14 and 30 - 33.

Claims withdrawn but not canceled: None.

Claims pending: 15 - 29.

Claims allowed: none.

Claims rejected: 15 - 29.

The claims on appeal are 15 - 29. A copy of the claims on appeal is attached hereto in the Claims Appendix. Appellants respectfully appeal the final rejection of claims 15 - 29.

4. STATUS OF AMENDMENTS - 37 CFR 41.37(c)(1)(iv)

A response under 37 CFR 1.116 with no amendment to the claims was filed on 30 November 2010. The final rejections were maintained per the Advisory Action mailed 13 December 2010.

5. SUMMARY OF THE CLAIMED SUBJECT MATTER- 37 CFR 41.37(c)(1)(v)

CONCISE EXPLANATION OF SUBJECT MATTER DEFINED IN INDEPENDENT CLAIM 15.

With reference by page and line number to the detailed description, and with reference to the figures, the following summary describes one or more exemplary embodiments disclosed in the Specification and which are covered by one or more specific claims, but it is to be understood that the claims are not so limited in scope.

With reference to Figures 1 - 4, generally, **independent claim 15**, the sole independent claim, is directed to a method for operating a metal strip mill train such as shown in FIG. 1. See page 1, lines 12 - 13. Before summarizing terms of the claim, a brief background is provided to facilitate providing an understanding of the invention.

The term intrinsic strip flatness ip refers to the strip length distribution over tracks $S1$ to S_n , while the term visible flatness vp refers to a measured flatness which results from buldge behavior of an individual strip. Visible flatness vp may be a function of strip thickness, strip width, elasticity of the strip and tension to which the strip is subjected. With reference to Figure 4, visible flatness vp may be measured at a discharge point $x2$, and intrinsic flatness ip may be calculated at a point $x1$ between or after roll stands 3 of a finishing train. See page 6, lines 11 - 16. As explained at page 7, lines 16 - 31, the flatness values (ip and vp) are preferably determined in the following sequence:

- (1) The visible flatness vp , which generally corresponds to the bulge behavior of the metal strip 1, is measured after a last roll stand 3, for example at the discharge point of a finishing train.
- (2) The bulge model 12 (also referred to as the "strip model") is used to determine the intrinsic flatness ip of the metal strip 1 at the point for measuring the visible flatness vp .
- (3) The material flow model 9 is used to determine the intrinsic flatness ip between the roll stands 3, for example within the finishing train. The intrinsic flatness can therefore be determined before the physical point for measuring flatness.

A feature of the invention is that a material flow model 9 is used to set variables so that the model determines an intrinsic flatness pattern which results from the processing through a roll stand. Thus, in the true sense of a model, the model 9 is used to control settings which result in predicted behavior. On the other hand, the prior art uses comparative data, e.g., in the context of feedback, to adjust parameters in order to eventually converge upon a desired feature.

According to claim 15, a desired flatness of the strip is determined via a material flow model. As explained at page 8, lines 1 - 13, the relationship between an intrinsic flatness i_p , between the roll stands 3, and an intrinsic flatness i_p after the last of the roll stands 3 is established using the material flow model 9. Input variables such as the strip thickness contours of the metal strip 1 as well as flatness patterns or flatness values before and after passage through a roll stand 3 can be supplied to the material flow model 9. The material flow model 9 determines the intrinsic flatness pattern of the metal strip 1 online after passage through the roll stand 3 as well as a roll force pattern in the transverse direction y of the metal strip 1 and supplies it to a roll deformation model. The roll deformation model is preferably part of a regulating unit 11. The roll deformation model determines roll deformations and supplies them to a target value determination unit, which uses the determined roll deformations and a contour pattern of the metal strip 1 on the stand discharge side to determine the target values for the profile and flatness control elements in each individual roll stand 3.

Further in accord with claim 15, an actual flatness (e.g., vp) of the metal strip is measured near a discharge point of the mill train. See page 6, lines 18ff which state, with reference to Figure 4, that vp is measured at one point x_2 at the discharge point of the mill train and is supplied to a bulge model 12 (strip model). With a topometric measurement of the visible flatness vp the surface structure of the metal strip 1 is captured at the surface and three-dimensionally over large areas of the metal strip 1.

Also per Claim 15, the measured metal strip flatness is translated into flatness values. See page 2, lines 7 - 16 which explain that by taking into account both the visible flatness vp of the mill train and the intrinsic flatness i_p with the aid of the bulge model (strip model) means that extremely stringent requirements can be complied with in respect of the quality of the visible flatness of the metal strip. By translating values for the visible flatness into values for the intrinsic flatness or values for the intrinsic flatness into values for the visible flatness, intrinsic

strip flatness values calculated using the material flow model and visible strip flatness values measured at the discharge point of a mill train can be brought into line with each other or verified.

Thus, also according to the method of claim 15, **a roll stand of the mill train is controlled via a strip shape model providing a relationship between intrinsic flatness i_p and visible flatness v_p and that uses the desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of the metal strip.** In this regard, see page 8, lines 1 - 23. Recalling that the material flow model 9 determines the intrinsic flatness pattern of the metal strip 1 after passage through the roll stand 3 and supplies it to a roll deformation model, the roll deformation model determines roll deformations and supplies them to a target value determination unit, which uses the determined roll deformations and a contour pattern of the metal strip 1 to determine the target values for the profile and flatness control elements in each individual roll stand 3. Use of the bulge model 12 (strip model) allows the material flow model 9 and the profile and flatness control implemented in the module 10 (see FIG. 1 in each instance) to be adjusted based on the measured data for visible flatness v_p . Upper and lower limits can be specified for the visible flatness v_p or for the corresponding visible lack of flatness of the strip and these limits can be translated with the aid of the bulge model 12 into limits for the intrinsic flatness i_p or intrinsic lack of flatness. The bulge model 12 (strip model) uses the intrinsic lack of flatness to calculate the bulge pattern of the metal strip 1. The calculated bulge pattern can be used in turn to determine the visible lack of flatness. Inverse modeling is used for the converse conclusion.

6. GROUNDS OF REJECTION TO BE REVIEWED UPON APPEAL - 37 CFR 41.37(c)(1)(vi)

1. Whether claims 15 - 18 are unpatentable under 35 U.S.C. Section 102 as anticipated by U.S. Patent No. 6,513,385 (Jonsson).
2. Whether claim 19 is unpatentable under 35 U.S.C. Section 103 over Jonsson in view of Ginzburg (U.S. 4,771,622).
3. Whether claims 20 - 25 are unpatentable under 35 U.S.C. Section 103 over Jonsson in view of Ginzburg and further in view of Hong (U.S. 6,427,507).
4. Whether claims 26 - 29 are unpatentable under 35 U.S.C. Section 103 over Jonsson in view of Ginzburg and Hong in view of Barten (U.S. 6,779,373).

7. ARGUMENT 37 CFR 41.37(c)(1)(vii)

APPELLANTS TRAVERSE ALL REJECTIONS BASED IN WHOLE OR PART ON THE JONSSON REFERENCE (U.S. 6,513,385).

Patentability of Each Claim is to be Separately Considered

Appellants urge that, to the extent the claims are separately argued, patentability of each claim should be separately considered. General argument, based on deficiencies in the rejection of independent claim 15 demonstrates patentability of all dependent claims. However, none of the rejected claims stand or fall together because each dependent claim further defines a unique combination that patentably distinguishes over the art of record. For this reason, the Board is requested to consider all argument presented with regard to each dependent claim. To the extent provided, argument demonstrating patentability of each dependent claim is presented under subheadings identifying each claim by number.

General Basis To Overturn All Rejections Under Section 102

In order to sustain the rejection of independent claim 15, MPEP §2131 provides that a claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. The identical invention must be shown in as complete detail as contained in the claim. It is fundamental that all of the claimed features be found in the prior art combination in order to make a rejection. Yet this appeal is made because the prior art combinations used to reject the claims fail to provide all of the features and functions recited in claim 15.

7A. APPELLANTS TRAVERSE THE REJECTIONS OF CLAIMS 15 - 18 BASED ON JONSSON.

7A(1). REJECTION OF INDEPENDENT CLAIM 15 UNDER SECTION 102 BASED ON THE JONSSON IS IN ERROR.

Appellants submit that the art rejection under Section 102 does not and cannot identify every feature of independent claim 15 and claims 16 - 18 which depend therefrom. The following discussion illustrates how the rejection fails to identify all of the claimed features.

The following summary describes a repetitive cycle of rejections which have consistently failed to identify specific features of independent claim 15 and the claims which depend therefrom. This summary shows this examination to be a cascade of rejections which have carried forward the same deficiencies. The first appeal brief and all responses filed since the Examiner withdrew the application from the first appeal have attempted to point out that the rejections are deficient.

In response to the amendment filed 13 August 2009, the rejections under Section 103, based in part on Muller in view of Gramckow, were all withdrawn. In the remarks accompanying that amendment the applicant successfully urged withdrawal of those rejections in part because the Muller reference did not disclose determining a desired flatness of the strip via a *material flow model* ...

Furthermore, claim 15 has further distinguished over the prior art by requiring

controlling a roll stand of the mill train via a *strip shape model* providing a relationship between intrinsic flatness ip and visible flatness vp and that uses the desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of the metal strip.

Thus the method of independent claim 15 has been distinguished by requiring both a material flow model and a strip shape model. The Gramckow reference did not provide the requisite strip shape model providing a relationship between intrinsic flatness ip and visible flatness vp . As noted at page 3 of the office action mailed 19 May 2009, the earlier rejection could only rely on the Gramckow reference (at col. 2, line 59 - col. 3, line 11) for using desired and actual flatness values as inputs to reduce a difference between actual and desired flatness, but *this is not the same as using a model to provide a relationship between intrinsic flatness and visible flatness*. In this regard, the term “strip shape model” is defined in the specification (paragraphs 00041 - 00051). The mathematical equations presented in the cited paragraphs are representative of a model. On the other hand, neither of the prior art Muller and Gramckow references make use of a strip shape model. With the rejections based on this art having been withdrawn, new final rejections were presented prior to the first appeal. The first appeal was necessitated because the new and final grounds of rejection which were deficient for the very same reasons applicant argued for withdrawal of the prior rejections based on the Muller and Gramckow references.

In the final rejection made the subject of the first appeal, independent claim 15 was rejected over Ginsberg (U.S. 4,771,622) in view of Gramckow (U.S. 6,697,699) wherein the new prior art combination had the same deficiencies already noted with regard to the Gramckow reference. In the first appeal brief Applicant also made of record that the final rejection did not fully and clearly address every recitation in the claims. The rejection did not and could not find in the prior art a *strip shape model providing a relationship between intrinsic flatness ip and visible flatness vp* . At best, the final rejection could only rely on the Gramckow reference (at col. 2, line 59 - col. 3, line 11) for using desired and actual flatness values as inputs to reduce a difference between actual and desired flatness. *This is not the same as using a model to provide a*

relationship between intrinsic flatness and visible flatness. Nor did the final rejection identify a material flow model as also required by claim 15.

The current rejections which have necessitated this second appeal brief are based on similar errors which have lead to the withdrawal of all prior rejections in this application. The rejection of claim 15 as anticipated by Jonsson is addressed.

Claim 15 requires, among other features,

determining a desired flatness of the strip via a material flow model;
measuring an actual flatness of the metal strip near a discharge point of the mill train;
translating the measured metal strip flatness into flatness values;
controlling a roll stand of the mill train via a strip shape model providing a relationship between intrinsic flatness *ip* and visible flatness *vp* and that uses the desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of the metal strip.

The present rejection contends that the first feature of “*determining a desired flatness of the strip via a material flow model ...*” is met by a disclosure at col. 3, lines 5-8 and 31-34 of Jonsson, but that passage does not disclose this subject matter. The citation does refer to a control method, but says nothing with regard to using a **material flow model** to determine “a desired flatness of the strip.” For at least this reason alone the rejection of claim 15 as anticipated must be overturned.

However, claim 15 also requires

controlling a roll stand of the mill train via a **strip shape model** providing a *relationship between intrinsic flatness ip and visible flatness vp* and that uses the desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of the metal strip.

The rejection attempts to read the feature of “controlling a roll stand of the mill train via a strip shape model” on the passages in Jonsson at col. 4, lines 13 - 17 and 26 - 29, but the passages concern finding differences between target and measured values such as might be used in a feedback control loop instead of using a strip shape model. Note, specifically, lines 13 - 17 make reference to an adaptation algorithm to create a target value, i.e., an Optimized Mill Flatness Target (OMFT). This passage clearly indicates that errors are reduced to zero. As stated at col. 4, lines 18 ff the error is used to modify the target, implying an iterative procedure rather

than modelling of any sort. Absent disclosure of a strip shape model, there is a second reason to overturn the rejection of claim 15 based on anticipation.

Noting that the strip shape model of claim 15 provides “a relationship between intrinsic flatness ip and visible flatness vp , the rejection also contends that Jonsson discloses also a such relationship between intrinsic flatness ip and visible flatness vp at col. 4, lines 21-24. Appellants disagree. At best, (per the Examiner’s characterization) the passage might concern using OMFT (e.g., error being calculated by subtracting PRFT from PRF, which is supplied to an algorithm to generate a new target value). Using desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of a metal strip, is not the same as using a **model** that provides a relationship between intrinsic flatness and visible flatness.

The prior art does not disclose using a strip shape model to control a roll stand of a mill train. Nor does the prior art disclose providing a relationship between intrinsic flatness ip and visible flatness vp and using the desired and actual flatness values as **inputs** to the strip shape model in order to reduce the difference between the actual flatness and the desired flatness of the metal strip. Instead, as best understood, the Jonsson reference only discloses finding a difference and applying an algorithm to modify a compensation factor which results in an optimized mill flatness target value.

Applicant Appellant respectfully reiterates that the term “strip shape model” is defined in the specification at pages 9 - 11 (i.e., see paragraphs 00041 - 00051). The prior art does not disclose or use a strip shape model.

For all of these reasons the rejection of independent claim 15 under Section 102 is in error and must be reversed.

7B. THE REJECTIONS UNDER SECTION 102 OF CLAIMS 16 - 18 WHICH EACH DEPEND FROM CLAIM 15, AS ANTICIPATED BY THE JONSSON REFERENCE ARE ALSO IN ERROR.

7B(1) CLAIM 16 IS ALLOWABLE UNDER SECTION 102.

Claim 16 rises or falls with the claim from which it depends.

7B(2) CLAIM 17 IS ALLOWABLE UNDER SECTION 102.

Claim 17 rises or falls with the claim from which it depends.

7B(3) CLAIM 18 IS ALLOWABLE UNDER SECTION 102.

According to claim 18, the actual flatness is determined as a three-dimensional strip shape pattern. The rejection (see page 3 of the Final Office Action mailed 12 October 2010) states Jonsson **implies** the strip shape pattern is three dimensional. The argument is confusing, stating that col. 3, lines 42-44 somehow imply that the preferred flatness is a function of length, width and height, but the cited passage does not at all imply that Jonsson views a strip in terms of all three dimensions. Thus, the rejection of 18 is unsupported and should be reversed.

7C. CLAIM 19 IS ALLOWABLE UNDER SECTION 103 OVER THE JONSSON REFERENCE IN VIEW OF THE GINZBERG REFERENCE.

Claim 19 rises or falls with the claim from which it depends.

7D. THE REJECTIONS UNDER SECTION 103 OF CLAIMS 20 - 25 WHICH EACH DEPEND FROM CLAIM 15, BASED ON THE JONSSON REFERENCE IN VIEW OF THE GINZBERG AND FURTHER IN VIEW OF HONG IS ALSO IN ERROR.

7D(1) CLAIMS 20 - 22 ARE ALLOWABLE UNDER SECTION 103.

Claims 20 - 22 each rise or fall with the claim from which it depends.

7D(2) CLAIM 23 IS ALLOWABLE UNDER SECTION 103.

Claim 23 requires that the values for the desired flatness are translated into values for the actual flatness using the strip shape model. The feature cannot be found because the prior art does not disclose a model which translates values of desired flatness into values for the actual flatness using the strip shape model. See, for example, the above argument made for allowance of claim 15. The rejection cites text in the Jonsson reference at col. 4, lines 21-24 which may concern a flatness target, but which does not relate to a strip shape model.

7D(3) CLAIM 24 IS ALLOWABLE UNDER SECTION 103.

Claim 24 requires that the flatness values are translated in real-time. Despite citation to Ginzburg, it is not seen how this feature can be present in the prior art when there is no strip shape model which translates values of desired flatness into values for the actual flatness. Further, the rejection cites col. 3, lines 58-62 for disclosing that a strip is measured in real time. The text is devoid of such disclosure and certainly the requirement of claim 24 that the flatness values be translated in real time is not at all supported by this text. The rejection must be overturned.

7D(4) CLAIM 25 IS ALLOWABLE UNDER SECTION 103.

Claim 25 rises or falls with the claim from which it depends.

7E. THE REJECTIONS UNDER SECTION 103 OF CLAIMS 26 - 29 ARE ALSO IN ERROR.

Claims 26 - 29 each rise or fall with the claim from which it depends.

7F. CONCLUSIONS

Argument has been presented to demonstrate that the rejections under Section 102 and Section 103 are deficient and that numerous ones of the dependent claims further distinguish over the prior art. The Examiner has argued rejections when claimed features are not present in cited passages and when claimed features are not obtainable from the prior art. Because features of independent claim 15 are absent from the prior art, it was necessary to disregard those features of the independent claims and/or reconstruct the prior art with neither a teaching nor a motivation to do so. Anticipation has been argued when features of claim 15 are absent from the prior art and the references used to reject claims under section 103 must therefore be assembled in hindsight recognition of Appellants' teachings. For the detailed reasons presented, there cannot be anticipation of claim 15 and there cannot be a prima facie case of obviousness. None of the rejections can be sustained. All of the rejections should be overturned and all of the claims should be allowed.

8. APPENDICES

An appendix containing a copy of the claims involved in this appeal is provided herewith. No evidence appendix or related proceedings appendix is provided because no such evidence or related proceeding is applicable to this appeal.

Respectfully submitted,

Dated: April 8, 2011

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9. APPENDIX OF CLAIMS ON APPEAL

15. A method for operating a metal strip mill train, comprising:
 - determining a desired flatness of the strip via a material flow model;
 - measuring an actual flatness of the metal strip near a discharge point of the mill train;
 - translating the measured metal strip flatness into flatness values;
 - controlling a roll stand of the mill train via a strip shape model providing a relationship between intrinsic flatness i_p and visible flatness v_p and that uses the desired and actual flatness values as inputs to reduce the difference between the actual flatness and the desired flatness of the metal strip.
16. The method as claimed in claim 15, wherein the actual flatness of the metal strip is measured at the discharge point of the mill train.
17. The method as claimed in claim 15, wherein the actual flatness is determined as a strip shape pattern.
18. The method as claimed in claim 17, wherein the strip shape pattern is three-dimensional.
19. The method as claimed in claim 18, wherein a relative length of individual tracks of the metal strip is evaluated to determine the strip shape pattern along with a variable of the individual tracks selected from the group consisting of: wavelength, amplitude and phase offset.
20. The method as claimed in claim 19, wherein a laser measuring device is used to determine the desired flatness of the metal strip.
21. The method as claimed in claim 20, wherein the laser measuring device is a multi-track laser measuring device.

22. The method as claimed in claim 20, wherein the actual flatness of the metal strip is measured topographically.

23. The method as claimed in claim 22, wherein the values for the desired flatness are translated into values for the actual flatness using the strip shape model.

24. The method as claimed in claim 23, wherein the flatness values are translated in real-time.

25. The method as claimed in claim 24, wherein, the flatness values are translated in real-time via an approximation function.

26. The method as claimed in claim 25, wherein the metal strip shape pattern based on the strip flatness is determined via the strip shape model by applying an assumed temperature distribution in the transverse direction of the metal strip.

27. The method as claimed in claim 26, wherein the actual flatness of the metal strip is measured by a laser measuring device.

28. The method as claimed in claim 27, wherein the laser measuring device is a multi-track laser measuring device.

29. The method as claimed in claim 27, wherein a flatness limit value is predefined at points to control the mill train.

Serial No. 10/574,723

Atty. Doc. No. 2003P08417WOUS

10. EVIDENCE APPENDIX - 37 CFR 41.37(c) (1) (ix)

None

Serial No. 10/574,723
Atty. Doc. No. 2003P08417WOUS

11. RELATED PROCEEDINGS APPENDIX - 37 CFR 41.37(c) (1) (x)

None